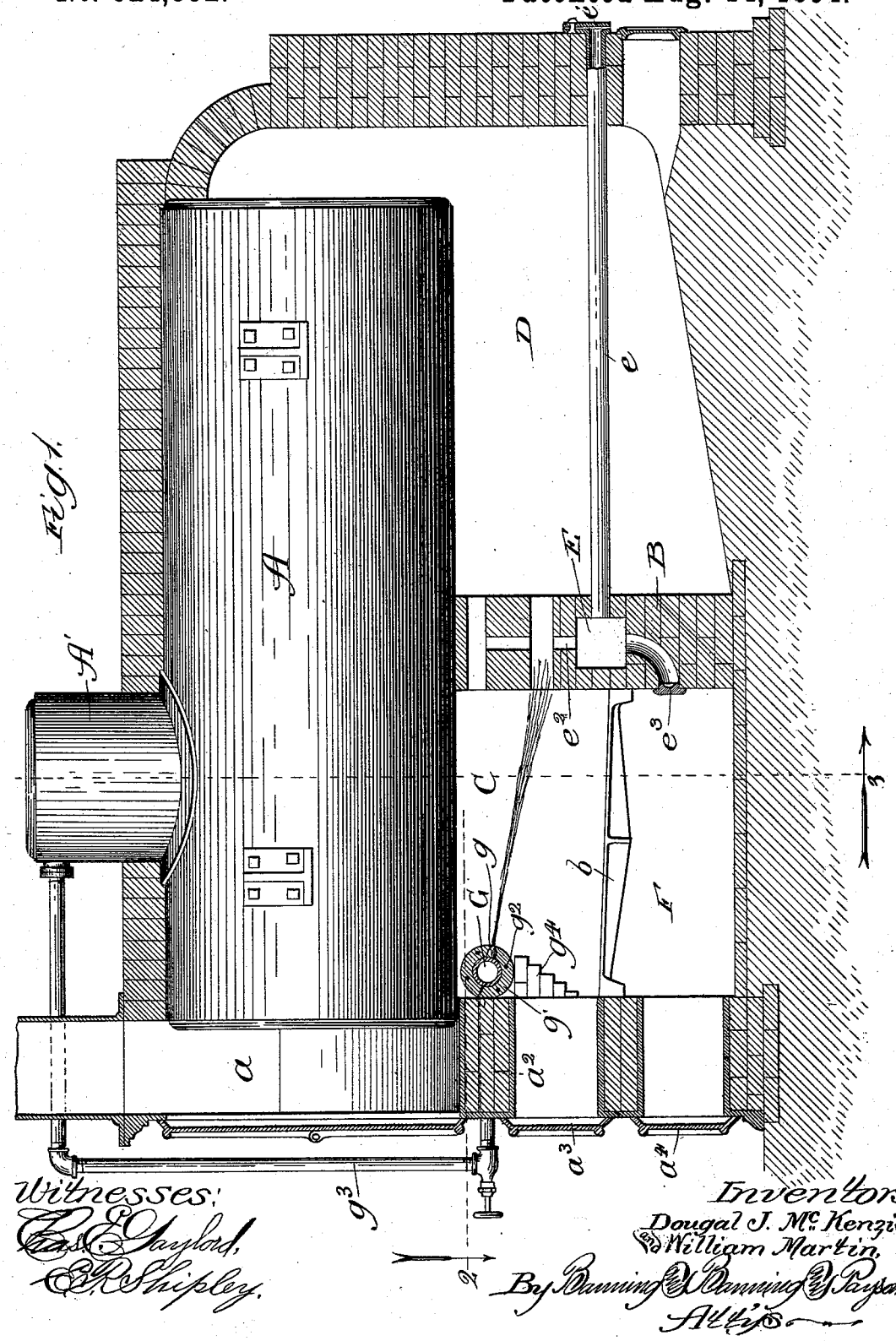
(No Model.) 3 Sheets—Sheet 1.

D. J. McKENZIE & W. MARTIN.

FURNACE.

No. 524,392. Patented Aug. 14, 1894.



Witnesses:
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D. J. McKENZIE & W. MARTIN.

FURNACE.

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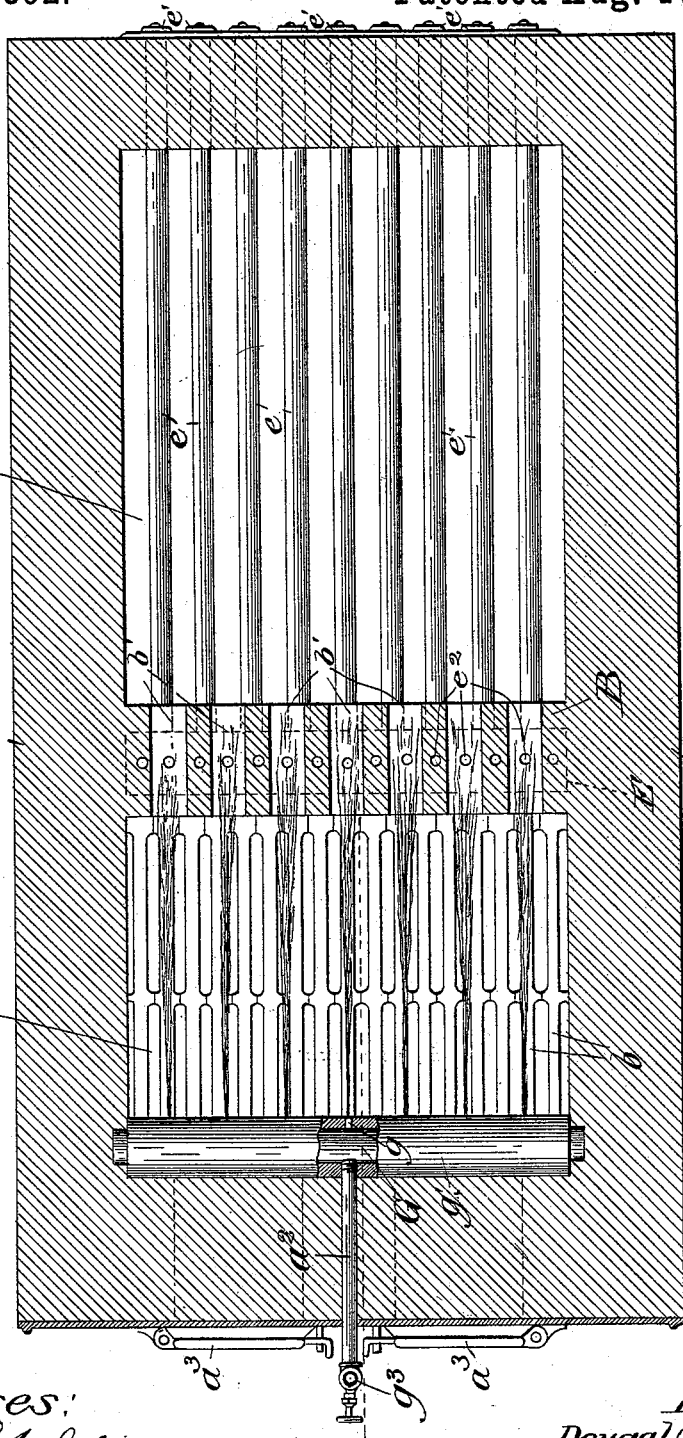

Fig. 2.

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D. J. McKENZIE & W. MARTIN.

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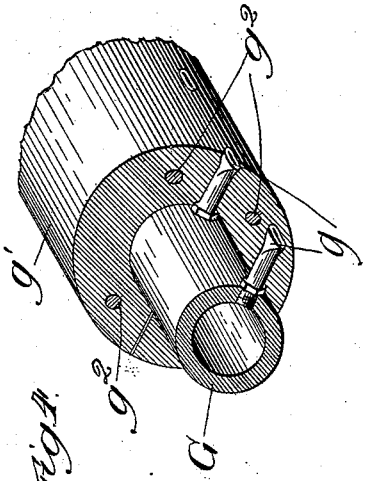

Fig. 4.

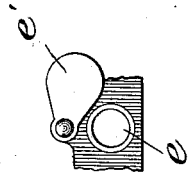

Fig. 5.

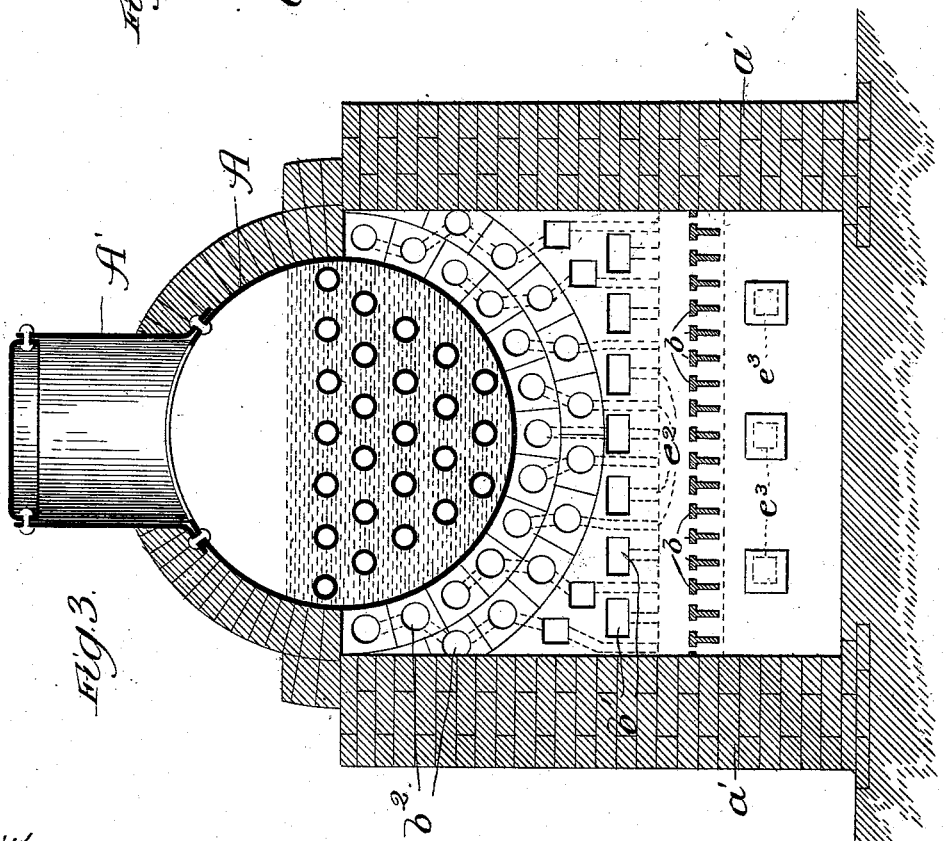

Fig. 3.

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UNITED STATES PATENT OFFICE.

DOUGAL J. McKENZIE AND WILLIAM MARTIN, OF CHICAGO, ILLINOIS.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 524,392, dated August 14, 1894.

Application filed July 21, 1893. Serial No. 481,151. (No model.)

To all whom it may concern:

Be it known that we, DOUGAL J. McKENZIE and WILLIAM MARTIN, of Chicago, Illinois, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

Our invention relates particularly to boiler furnaces, and has for its object to provide a simple, economical and efficient boiler furnace, particularly adapted to the complete combustion of fuel and the attainment of a very high degree of economy in the consumption of the same; and it consists in the details of construction, combinations and arrangements hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of our improved boiler and furnace, partly in section; Fig. 2 a horizontal section taken on the line 2 of Fig. 1, looking in the direction of the arrow; Fig. 3 a transverse section taken on the line 3 of Fig. 1; Fig. 4 a perspective view of a portion of the retort located in the fire box; and Fig. 5 an enlarged view of one of the draft regulators at the end of the feed air tubes.

In illustrating our improved furnace, we have shown it in connection with one class of boilers, viz., an external fired tubular boiler; but do not desire to be limited to this particular class of boilers, as the invention is capable, with slight mechanical changes, of being adapted and used in connection with any of the different classes of boilers now in use.

In constructing our improved boiler furnace, we use a boiler A, preferably of the return flue type and provided with the usual up-take a, which leads to the smoke stack to carry off the products of combustion. The boiler may be supported in any of the usual ways, by the side walls a' and by the front walls a^2, so as to leave an opening between the bottom of the boiler and the ground. Located in this opening, preferably about midway in the length of the boiler and between the boiler and the ground, is a bridge wall B, which may be formed of ordinary fire brick, and which rises to a height of about ten inches above the grate bars b. We fill the space between this bridge wall and the boiler proper with a structure composed first of a layer of fire bricks, through which extends a series of square openings b', and above this several layers of tiling formed of refractory material and provided preferably with longitudinal circular openings b^2, so that the portion of the bridge wall between the boiler from about ten inches above the fire grate is provided with a series of longitudinal openings arranged in any convenient manner, so as to furnish a communication between the fuel chamber C and the combustion chamber D, through which the heated gases must pass on their way to the up-take. The bridge wall is provided with an air chamber E, which communicates with the outer air by means of a series of feed air tubes e, which, in turn, are provided with dampers, e', at their outer ends for the purpose of regulating the amount of air admitted into the air chamber. This air chamber communicates with the longitudinal openings in the bridge wall by means of a series of channels e^2, and the entire bridge wall is ramified with a number of these channels which connect the longitudinal openings with each other and with the air chamber, for the purpose of furnishing and distributing a sufficient amount of atmospheric air to promote the combustion of the heated gases as they pass through the bridge wall on their way to the combustion chamber. The bridge wall is also provided with a number of openings e^3, which connect the air chamber with the ash pit for the purpose of furnishing a means by which the air chamber may be cleaned when it becomes clogged by the deposit of soot or other unconsumed material.

The front wall a^2, which acts as a support for one end of the boiler, is provided with the usual doors a^3, which communicate with the fire box and serve as a fuel door, or as an inlet for the admission of air to support combustion; and the door a^4, which communicates with the ash pit, F, to permit the removal of ashes, also serves as an inlet for the admission of air which enters into combustion with the heated gases in the furnace box.

Located preferably in the upper front corner of the fire box is a retort G, preferably made of hydraulic tubing, and provided with

a series of nozzles g, extending out in a direction toward the lower set of longitudinal openings in the bridge wall. This retort is surrounded by a jacket of refractory material g', made in several sections, which entirely incloses the retort and its nozzles, serving thereby to protect the metallic retort from the disintegrating influences of the heat, as well as to act as a reservoir for the storage of a certain amount of heat. By making the retort jacket in sections—first in half, and then each individual half in sections,—it allows the jacket to be easily taken off when consumed and a new one replaced. The jacket may be provided with several longitudinal openings g^2, through which may be inserted tie bolts for the purpose of bolting the jacket together and thereby preventing it falling to pieces, which it otherwise might do when cracked or broken by the action of the heat. The retort is supported in position by having its ends inserted a short distance into the side walls of the furnace, and the central portion supported by means of a corbeled projecting bridge g^4. The chamber in the retort communicates with and is connected to the steam dome A′ of the boiler, by means of a pipe g^3, which may be provided with an ordinary valve at its lower end for the purpose of regulating the amount of steam furnished from the boiler to the retort, thereby allowing the retort to be filled with steam at boiler pressure.

In using our improved furnace, fuel is supplied in the usual manner to the grate bars, and, after ignition, the requisite amount of air is furnished through the ash pit by means of the usual openings in the door of the same. When the fuel has attained a very high degree of heat, steam is admitted preferably from the boiler to the retort in the fuel chamber, where it becomes superheated, and is projected through the nozzles of the retort across the mass of incandescent fuel in a gaseous state—the steam having been decomposed and hydrogen gas liberated. The immense force thereby given forth from this retort throws the highly heated gases against the bridge wall and serves to heat the bridge wall to a state of incandescence. The hydrogen gas and the heated gases passing through this perforated bridge wall are furnished the requisite amount of air from the air chamber in the bridge wall to support combustion, and, passing out into the combustion chamber, a more perfect combustion takes place, and the flame, developing in the same, passes to the rear end of the boiler, back through the tubes in the same to the front of the boiler; and by this time the gases being nearly consumed, the products of combustion pass out through the up-take into the smoke stack.

As the flames expand in the combustion chamber, they contact the series of metallic feed air tubes which connect the air chamber in the bridge wall with the outside air and highly heat the same, so that the air which passes from the outside into the air chamber in the bridge wall is heated to a very high degree before it reaches the air chamber and is mixed with the heated gases, and thus serves to assist the combustion, and not check or lessen the degree of heat of the flame or gases as they are mingled with the air.

We claim—

1. In a heating apparatus, the combination of a furnace provided with a fuel chamber, a combustion chamber, a perforated bridge-wall separating said chambers and provided with an air chamber, means for furnishing the supply of air to such chamber, a retort located within the fuel chamber for holding a supply of superheated steam, and provided with a series of nozzles arranged and extending out in the direction to expel the superheated steam toward and against the lower set of openings in the bridge-wall, substantially as described.

2. In a heating apparatus, the combination of a furnace provided with a fuel chamber, a retort located within the fuel chamber provided with a series of nozzles, a refractory jacket surrounding the retort and nozzles and made of several sections, and a pipe connecting the chamber of the retort with a source of steam supply, so constructed and arranged that the refractory jacket may be removed and a new one inserted without disturbing the retort proper, substantially as described.

3. In a heating apparatus, the combination of a furnace provided with fuel and combustion chambers, a bridge wall separating such chambers, provided with an air chamber and longitudinal and vertical perforations connected with each other and with such air chamber, and a set of feed air tubes extending through the combustion chamber and connecting the air chamber with a supply of atmospheric air, substantially as described.

4. In a heating apparatus, the combination of a furnace provided with a fuel chamber, a combustion chamber, a perforated bridge wall separating said chambers and provided with an air chamber and channels connecting the longitudinal perforations with each other and the air chamber, means for furnishing air to the air chamber in the bridge wall, a retort provided with a series of nozzles located in the fuel chamber adapted to hold steam at boiler pressure, and a tube connecting the retort chamber with a source of steam supply, substantially as described.

5. In a heating apparatus, the combination of a furnace provided with a fuel chamber, a combustion chamber, a perforated bridge wall separating said chambers and provided with an air chamber and channels connect-

ing the longitudinal perforations with each other and the air chamber, means for furnishing air to the air chamber in the bridge wall, a retort provided with a series of nozzles located in the fuel chamber adapted to hold steam at boiler pressure, a jacket of refractory material surrounding the retort and nozzles, and a tube connecting the retort chamber with a source of steam supply, substantially as described.

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